

REMARKS

Reconsideration and allowance of this application are respectfully requested in light of the above amendments and the following remarks.

At the outset, the Applicants wish to thank the Examiner for the courtesy shown to their representatives during a personal interview on October 16, 2008. The participants in the interview were Examiner Zewdu, Kaoru Takagahara, Yasuhide Ono and the undersigned. The interview involved a discussion of independent claims 1 and 31 and proposed new claims 32-35, and the distinctions over the teachings of Sampath (USPN 6,922,445), Miyata et al. (US 2004/0022205) and Paulraj (USPN 6,067,290) applied under 35 USC 103(a) at pages 3-5 of the office action. No agreement was reached during the interview. The following includes a summary of the substance of the discussion during the interview.

It was noted during the interview that the present claimed invention performs radio communication using a communication band that employs a plurality of subcarriers divided into a plurality of divided bands, with each divided band comprising a plurality of the subcarriers.

In particular, according to claims 1 and 31, the invention detects adaptability to spatial multiplexing (SM) for each divided band, that is, on a divided band basis, and sets, for each divided band, a respective transmission format used to carry out the radio transmission based on the adaptability detected for each divided band. According to new claims 32 and 34, the invention composes a plurality of divided bands, each divided band including a plurality of subcarriers in a communication band for multicarrier transmission, and sets, for each of the plurality of divided band, a respective transmission format including a spatial multiplexing number used to carry out radio transmission. The invention provides advantages of enabling the amount of processing to be decreased and thus enables the scale of the apparatus to be decreased.

It is submitted that none of the applied references teaches or suggest the notion of a "divided band" with each divided band including a plurality of subcarriers in a communication band for multicarrier transmission.

The office action cites the following portions of Sampath: Figs. 1-2, col. 3, lines 14-67, col. 7, lines 62-67, and col. 14, line 54 - col. 15, line 7. The Applicants respectfully submit that Sampath nowhere discloses or suggests the use of divided bands or setting a parameter individually for divided bands.

Although Sampath relates to selecting antennas for transmitting data over a channel by employing spatial multiplexing, in Sampath, each antenna corresponds to the whole communication band, not a "divided band." Regarding spatial multiplexing in Sampath, col.3, lines 40-51 indicates that a channel descriptor has "sub-descriptors" corresponding to the transmit antennas. A threshold is set for a quality parameter, and a sub-descriptor that does not meet the threshold is identified and an antenna that corresponds to the sub-descriptor is deactivated. More particularly, each sub-descriptor is referred to as "h" in Fig. 3 and Fig. 6. ("h" is a column in a channel matrix H.) As shown in Fig. 6, for each sub-descriptor "h," a quality parameter QP is compared with a threshold QP_{Th}, and an antenna with low quality parameter is deactivated. That is, antennas with good quality parameters are used to transmit a plurality of data streams. Sampath does not discloses the use of "divided bands." Accordingly, spatial multiplexing in Sampath is performed on a communication band basis, not a "divided band" basis.

With respect to the portions of Sampath cited in the office action, the Applicants provide the following discussion and submit that none of these portions teaches or suggest the notion of a "divided band."

Col. 3, lines 14-67 of Sampath is cited at page 3, last paragraph, of the office action merely for disclosure of setting a transmission format.

Col. 3, lines 60-67 of Sampath cited in the office action refers to use of plural sub-carrier tones rather than one carrier frequency. In this case, an average value is determined for the quality parameter over the plural sub-carrier tones. The sub-descriptor is associated with this average value. The average value is compared with the threshold to determine whether the associated antenna is to be deactivated or not.

Col. 7, lines 62-67 of Sampath cited in the office action discusses multi-carrier modulation such as OFDM employing plural sub-carriers, with each sub-carrier having an individual channel represented by an NxM matrix where N is the number of receive antennas and M is the number of transmit antennas.

Col. 14, line 54 - col. 15, line 7 of Sampath cited in the office action refers to multicarrier systems using spatial multiplexing, wherein several sub-carrier frequencies are transmitted from each transmit antenna. Because each sub-carrier experiences a different channel and a different quality parameter, each transmit antenna has associated with it a group of sub-descriptors, i.e., one for each sub-carrier. Thus, the antenna selection is made based on the average quality parameter for the group of sub-descriptors associated with a given antenna.

It is apparent that none of the above-discussed portions of Sampath (and indeed nothing in any portion of Sampath) discloses or suggests the use of divided bands comprising a plurality of subcarriers or setting a parameter individually for divided bands. More particularly, Sampath fails to teach or suggest the present claimed subject matter of detecting adaptability to spatial multiplexing (SM) for each divided band, and setting, for each divided band, a respective transmission format used to carry out the radio transmission based on the adaptability detected

for each divided band or the subject matter of composing a plurality of divided bands, each divided band including a plurality of subcarriers in a communication band for multicarrier transmission, and setting, for each of the plurality of divided band, a respective transmission format including a spatial multiplexing number used to carry out radio transmission.

The Office Action states that Sampath does not disclose a detection section that detects adaptability to space multiplexing. The office action relies on paragraph [0009] of Miyata for a teaching of a detection section.

However, the Applicants note that Miyata relates to detection of whether a transmission slot is suitable or not and use or non-use of the transmission slot based on whether the slot is determined to be suitable or not. A slot in Miyata is not a divided band comprising a plurality of subcarriers as in the present claimed invention, but rather merely a “time slot” as shown in Fig. 3 and paragraph [0096]. It is submitted that the cited portion of Miyata bears no pertinence to the present claimed feature of detecting adaptability for the respective divided bands and setting a respective transmission format for each of the divided sub-bands based on the adaptability detected for the respective divided band. Miyata fails to teach or suggest the notion of “divided bands” as employed in the present claims, i.e., wherein each divided band includes a plurality of subcarriers in a communication band for multicarrier transmission. Thus, it is submitted that Miyata fails to cure the above-noted deficiencies in Sampath, and the individual or combined teachings of Sampath and Miyata fail to render obvious the present claimed subject matter.

The office action cites Paulraj by itself (not in combination with the other applied art) and cites the following portions thereof: the Abstract, claim 1, Figs. 1-3, col. 3, lines 43-67, col. 5, lines 45-58, col. 6, lines 25-59, col. 7, lines 20-40, and col. 12, lines 25-35. The Applicants

respectfully submit that this reference nowhere discloses or suggests the use of divided bands comprising a plurality of subcarriers or setting a parameter individually for divided bands.

Instead, Paulraj merely discloses a wireless communication system which may employ spatial multiplexing involving producing, from a single data stream, a number of spatial-multiplexed streams to be transmitted over a plurality of transmit antennas at the transmitter, wherein the number of data streams is determined based on feedback from a receiver indicating a channel quality parameter. Each data stream passes through a corresponding space-time coder each of which produces plural coded streams, as shown in Fig. 3. Each of the space-time coded streams is modulated and simultaneously transmitted from a different transmit antenna TA in accordance with a selected mapping scheme. Pauraj states that all transmit antennas TA can use the same modulation format and carrier frequency, or alternatively, different modulation or symbol delay can be used, while other approaches include the use of multi-carrier techniques or spreading codes. Figs. 6 and 7 of Paulraj disclose a multiple access system such as, for example, OFDMA. It is submitted that Paulraj nowhere discloses or suggests the use of divided bands comprising a plurality of subcarriers or setting a parameter individually for divided bands.

Accordingly, the Applicants respectfully submit that Paulraj fails to teach or suggest the present claimed subject matter of detecting adaptability to spatial multiplexing (SM) for each divided band, and setting, for each divided band, a respective transmission format used to carry out the radio transmission based on the adaptability detected for each divided band or the subject matter of composing a plurality of divided bands, each divided band including a plurality of subcarriers in a communication band for multicarrier transmission, and setting, for each of the plurality of divided band, a respective transmission format including a spatial multiplexing number used to carry out radio transmission.

In accordance with the discussion provided above, the Applicants respectfully submit that the applied references, considered alone or together, fail to teach or suggest the subject matter of the pending claims, and that allowance of independent claims 1, 31, 32 and 34, and all claims dependent therefrom, is warranted.

Thus, it is submitted that this application is in condition for allowance, and a notice to that effect is respectfully solicited.

If any issues remain which may best be resolved through a telephone communication, the Examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,

/James Edward Ledbetter/

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James E. Ledbetter
Registration No. 28,732

JEL/att

ATTORNEY DOCKET NO. 009289-06109

Dickinson Wright PLLC
1875 Eye Street, N.W., Suite 1200
Washington, D.C., 20006
Telephone: 202.457.0160
Facsimile: 202.659.1559